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| 10/785,988      | 02/26/2004  | Kenji Yamaga         | 500.43536X00        | 2657             |

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| EXAMINER |
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CANTELMO, GREGG

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| ART UNIT | PAPER NUMBER |
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1745

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE  | DELIVERY MODE |
|--|------------|---------------|
| 3 MONTHS                               | 02/20/2007 | PAPER         |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/785,988

Applicant(s)

YAMAGA ET AL.

Examiner

Gregg Cantelmo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-16 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☒ Claim(s) 1-7 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 2/26/04.

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_.

## **DETAILED ACTION**

### ***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Information Disclosure Statement***

2. The information disclosure statement filed February 26, 2004 has been placed in the application file and the information referred to therein has been considered as to the merits.

### ***Drawings***

3. The drawings are objected to because the description recited on pages 11, ll. 5-8 is not shown in the drawings. There is no diffusion layers 2 or separator 1 in any of Figs. 2a-2d and these reference characters do not correlate with the initial reference character description provided in the paragraph bridging pages 5 and 6. For example, in the paragraph bridging pages 5 and 6, reference character 1 is defined as the polymer electrolyte (not a separator) and reference character 2 is defined as the cathode (not a diffusion layer). In addition the drawings fail to show the comb teeth on or in the diffusion layer as described in page 11, ll. 5-8. Rather the drawings show the comb teeth 33 provided between the separator and seal sheet or in the separator sheet 10 itself and adjacent to the diffusion layer 12 (see Figs. 2d and 2e). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the

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sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the diffusion layer having the comb teeth structure (claims 5, 6 and 16) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered. The diffusion layers 12 are not shown to have the comb teeth structure itself but instead are adjacent to the comb teeth structure provided in the separator 10 (see Fig. 2E).

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is

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being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

5. The abstract of the disclosure is objected to because it exceeds 150 words. A 150-word limit has been imposed by the USPTO to conform to PCT applications and Pre-Grant Publications. See 37 CFR 1.72 and rule changes applied thereto. Correction is required. See MPEP § 608.01(b).

### ***Claim Objections***

6. Claim 1 is objected to because of the following informalities: "in such a way" should be changed to "so as". This applies to dependent claims 2-7 for the same reasons. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any

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person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. One claimed and disclosed embodiment is to a combination of the seal sheet and separator (Fig. 2D) which defines the respective reactant passages. The specification recites: "A fuel cell was prepared in EXAMPLE 6 using the structurally same components as those for the fuel cell prepared in EXAMPLE 1, except that the diffusion layer 12 had comb teeth structures 33 on the two sides facing each other." But the diffusion layer does not have two sides facing each other but rather is a single layer wherein any given two sides are either on opposite sides of the diffusion layer or perpendicular to one another. There are no sides of the diffusion layer 12 which face each other.

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Claim 1 recites the limitation "the manifold" in line 11. There is insufficient antecedent basis for this limitation in the claim. Furthermore

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there are separate and distinct manifolds for each of the fuel and oxidizing gas and the claims should impart language to clearly identify and differentiate the manifolds.

b. Claim 1 recites the limitation "the slit spaces" in line 22. There is insufficient antecedent basis for this limitation in the claim. While the claim clearly defines slit spaces relative to a comb teeth structure for the fuel gas flow arrangement, the claim does not clearly define such for the oxidizing gas flow arrangement. The term "another structure between the oxidizing gas passage section and manifold" does not provide clear and reasonable enablement for a second comb teeth structure having slit spaces. Again applicant is advised to amend the claims to clearly define the claimed invention.

c. The claims appear to recite a fuel gas flow and separator for the fuel gas flow having a fuel manifold, fuel gas passage, fuel side separator comb teeth structure and slit spaces as well as an oxidizing gas flow separator for the oxidizing gas flow having an oxidizing gas manifold, oxidizing gas passage, and oxidizing gas side separator comb teeth structure and slit spaces. The claims often refer back to particular manifolds, comb teeth structures and slit spaces without clearly specifying whether these elements are the fuel or oxidizing gas elements. For purposes of clarity applicant is advised to associate the particular reactant associated with each gas flow element recited in the claim so as not to be ambiguous. This applies to dependent claims 2-7 and is linearly applied

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to claims 8-11. For example, claim 2 recites "said seal sheet" however since there are two seal sheets in claim 1, it is unclear what seal sheet is specifically being referred to.

d. Claim 3 recites the limitation "the extension of the convexes" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim. This also applies to claim 10.

e. Claim 4 recites the limitation "said slit spaces" in line 2. There is insufficient antecedent basis for this limitation in the claim. Again since there appear to be two separate slit spaces, it is unclear which slit spaces are being referred to, if not both. This also applies to claim 11

f. Claim 5 is unclear in the context of claim 1. Claim 5 recites that the diffusion layer has the comb teeth structure whereas claim 1 recites that the comb teeth structure is in communication with the diffusion layer (thus not in the diffusion layer itself). Again since there appear to be two comb teeth structures and gas diffusion layers, it is unclear which comb teeth structures and/or diffusion layer(s) are being referred to, if not both. This also applies to claim 16 (and claim 12).

g. Claim 7 recites the limitation "the comb teeth structure is formed on each of the two sides of the diffusion layer facing each other" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim. Again claim 1 requires two comb teeth structures and two diffusion layers and does not recite that "the diffusion layer facing each other". Additionally there is no antecedent basis for "the diffusion layer facing each other".



The specification recites: "A fuel cell was prepared in EXAMPLE 6 using the structurally same components as those for the fuel cell prepared in EXAMPLE 1, except that the diffusion layer 12 had comb teeth structures 33 on the two sides facing each other." But this description itself is ambiguous since it teaches of using structure 33, shown only to be provided between the seal layer and separator (Fig. 2D) and not in the embodiment between the diffusion layer and separator (Fig. 2E). In addition the diffusion layer does not have two sides facing each other but rather is a single layer wherein any given two sides are either on opposite sides of the diffusion layer or perpendicular to one another. There are no sides of the diffusion layer 12 which face each other. Thus the exact nature and arrangement recited in the claim is not held to be reasonably described and thus indefinite. And in the absence of any clear description of this arrangement, the invention recited therein cannot reasonably be interpreted

- h. Claim 9 recites the limitation "said seal sheet in line 2. There is insufficient antecedent basis for this limitation in the claim.
- i. Claim 14 recites the limitation "the extension of said gas passage section" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim.
- j. Claim 13 is indefinite since recitation of a "preferable" range does not limit the claim to the preferred value(s) defined in the claim and render the exact scope of the claims indefinite.

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k. The term "pitch" in claims 4, 11 and 15 is indefinite. The exact nature of the term is not clear nor how the dimensions specified in relation to the term further define the slit spaces and comb-teeth structure. Does it relate to the spacing of the slits, height of the slits, slant or angling of the slits? Clarification is respectfully requested.

In summation, it is apparent the claims are replete with 112 2<sup>nd</sup> paragraph issues. Applicant is advised to review future claim amendments both to clarify any indefinite issues set forth herein and to present new claim language which does not raise any new 112 1<sup>st</sup> and/or 112 2<sup>nd</sup> paragraph rejections.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

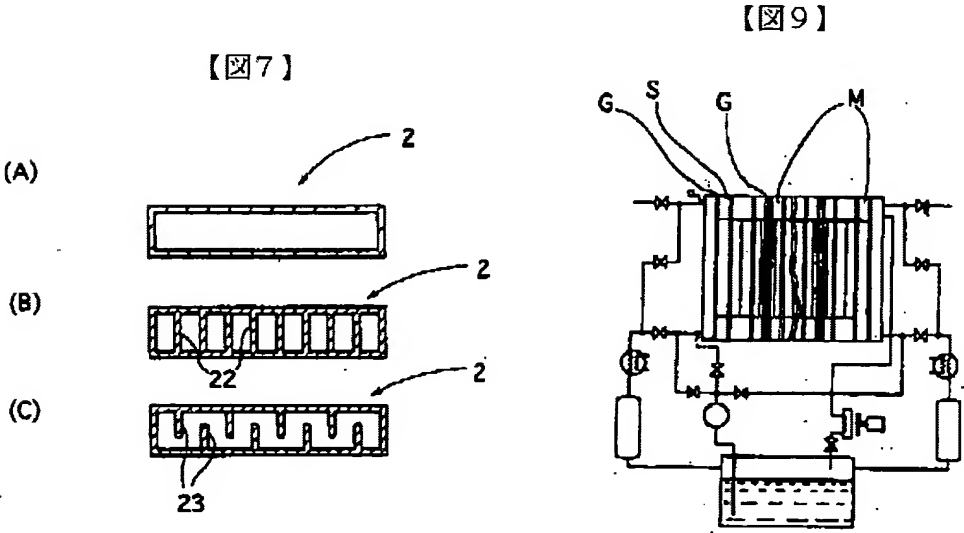
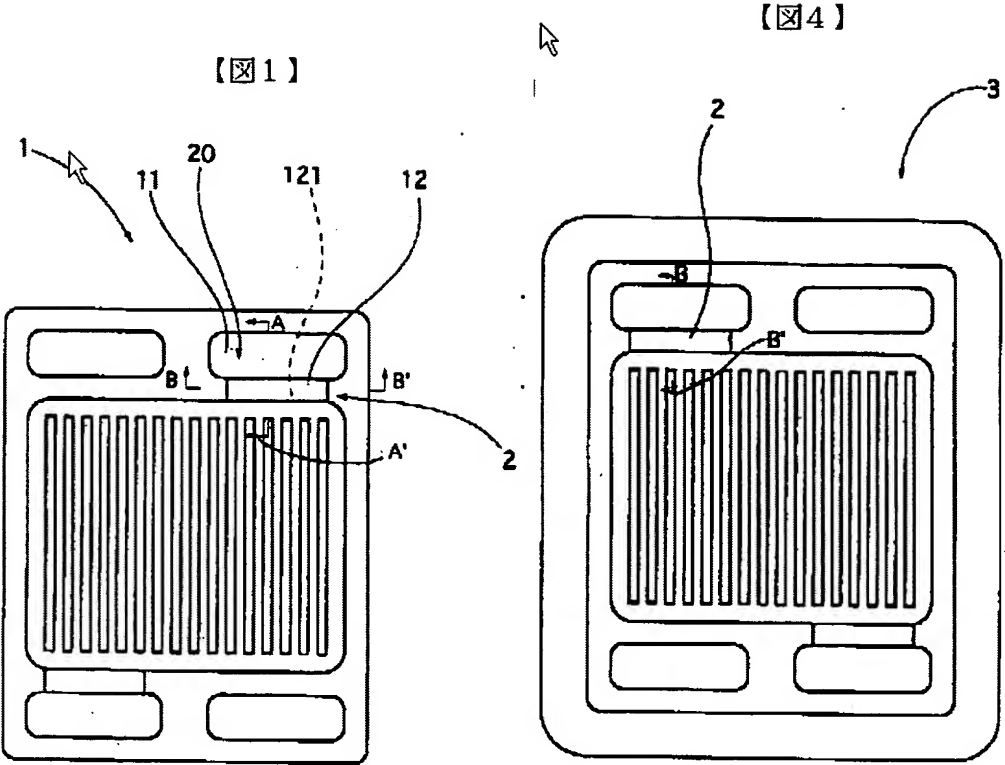
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 3, 6, 8, 10, 12, 14 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 2001-266910A (JP '910).

JP '910 discloses a fuel cell having at least one unit (Fig. 9) comprising a separator design which is used as both a first separator in which a fuel gas passage section is formed and provided on the fuel side of the fuel cell and a second separator in which an oxidizing gas passage section is formed on the oxidizing side of the fuel cell. Each fuel cell includes gas diffusion layers adjacent to the anode and cathode, respectively and a polymer electrolyte

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membrane (abstract, Fig.9 and paragraphs 25-26). Each separator comprises a seal sheet (shown in Fig. 4) seals the periphery of the separator 3 and further includes reactant gas flow passages which are in communication with their respective manifolds and region 2 provided in each separator which is configured in various ways including a comb teeth structure (see Fig. 7) where slit spaces are provided between the comb teeth (22 or 23) and each manifold in the respective fuel-side and oxidizing side separators is in fluid communication with the central gas passage section via the comb-teeth structure provided in intermediate connection 2 (Figs. 1, 4 and 7 as applied to claim 1). In addition this fuel cell described above is a stack of fuel cells as shown in Fig. 9 (applied to claim 8). And as discussed above, the separators described therein further anticipate the separator structure of claim 12.



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The comb teeth structure 2 is provided on an extension region to the gas passages between the manifold and gas channels (Fig. 4 as applied to claims 3, 10 and 14).

The voids in the structure 2 shows configurations wherein the voids constitute a greater percentage of the structure relative to the comb teeth 22 or 23 and have no load applied therein and thus reasonably anticipates the broadly claimed void fraction of 50-90% (as applied to claims 6 and 16).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary.

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Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 2, 9 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP '910 in view of U.S. Patent No. 6,231,053 (Wakamatsu).

The teachings of JP '910 have been discussed above and are incorporated herein.

The difference between claims 2, 9 and 13 and JP '910 is that JP '910 does not teach wherein the periphery around each of the first and second separators on which the seal sheet is placed is 1mm thick or less.

As shown in Figs. 1 and 4, the separator includes a seal sheet about the perimeter of the separator plate. It should be noted that the seal sheet as claimed can have any configuration such as a solid continuous sheet or a framing sheet. This is held to be a reasonable interpretation of the claimed seal sheet since the instant application itself teaches that the seal sheet can be either configuration (See Figs. 2D and 2E).

Wakamatsu discloses providing peripheral thickness of separators and seals to thicknesses which include thicknesses under 1mm (see Embodiments).

The motivation for using the thicknesses suggested by Wakamatsu is that it decreases the stack height, improves the electrical generating efficiency of the

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stack and provides a stack having an effective seal in a stack configuration which is both lighter and thinner.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of JP '910 by setting the thickness of the periphery around each of the first and second separators on which the seal sheet is placed to be 1mm thick or less as suggested by Wakamatsu since it would have decreased the stack height, improved the electrical generating efficiency of the stack and provides a stack having an effective seal in a stack configuration which is both lighter and thinner. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

11. Claims 4, 11 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP '910 in view of U.S. Patent Application Publication No. 2004/0110056 (Hato).

The teachings of JP '910 have been discussed above and are incorporated herein.

The difference between claims 4, 11 and 15 and JP '910 is that JP '910 does not teach of the pitch of the slit spaces.

As best that the term can be interpreted the term pitch has been interpreted to be the size of the slit passages.

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JP '910 discloses various configurations in Fig. 7 including comb-teeth structures.

Hatoh teaches of similar separator plate configurations (see Figs. 5 and 6) wherein the channels have dimensions between 0.79 and 1.33 mm (paragraphs 47-48).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of JP '910 to select the "pitch" of the slits to also have a dimension from 0.79 to 1.33 mm as taught by Hatoh since it would have prevented water flooding in the gas passages while maintaining cell performance and prevent reactant pressure loss in the channels. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

12. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP '910 in view of U.S. Patent Application Publication No. 2004/0110056 (Hatoh) or

The teachings of JP '910 have been discussed above and are incorporated herein.

The difference between claim 5 and JP '910 is that JP '910 does not teach of the thickness of the gas diffusion layer.

As best that claim 5 can be understood, while the claim recites that the gas diffusion layer has the comb teeth structure, this arrangement is not clearly



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shown nor reasonably described. It would appear from the specification that the comb teeth structure is provided in the separator plate but nowhere does the specification reasonably show this arrangement.

As such the claim has been interpreted, in light of the specification, such that the claimed diffusion layer does not have the comb teeth structure in it but rather is in proximity to the comb teeth structure.

Thus as to the thickness of the diffusion layer of JP '910:

Hatch teaches of gas diffusion layers having thickness from about 100-400 microns or 0.1-0.4mm (see prior art claim 5 and paragraph 53).

The motivation for using a gas diffusion layer having this thickness is that it provides a gas diffusion layer having large gas permeability, good electrical conductivity and good water discharge properties.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of JP '910 to select the gas diffusion layer of JP '910 to have a thickness from about 0.1-0.4 mm since it would have provided a gas diffusion layer having large gas permeability, good electrical conductivity and good water discharge properties. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

### ***Conclusion***

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is 571-272-1283. The examiner can normally be reached on Monday to Thursday, 8:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

gc

February 15, 2007



Gregg Cantelmo  
Primary Examiner  
Art Unit 1745